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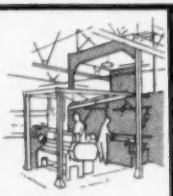

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The Reading of Scientific Papers

IT IS one of the oldest traditions of science that papers should be presented at meetings, and that after a paper, perhaps once better known as a discourse, there should be critical discussion. How far the continuation of this tradition still plays a large part in progress, it is hard to assess. The vast widening of science and its diverse specializations has made it physically impossible for even the most determined and mobile of men to attend every meeting at which papers relevant to his interests are read. The attendance at a meeting rarely represents more than a small fraction of the 'audience' to whom the paper is of direct importance. Yet this initial presentation from a rostrum is a custom of scientific society, as firmly established as the bursting of a champagne bottle when a ship is launched. By no means all scientific papers appearing in journals are orally delivered, but many are—as a fairly broad generalization, the initial public presentation is more customary if the scientist is well known, or if some recent contribution has put him into the 'promising young man' class.

The paper that is read at a meeting may not be the most important event. The fact that each such paper and meeting provides an occasion for scientists with kindred interests to gather together may well be of greater importance; put another way, the habit of meeting regularly may matter far more than its scheduled purpose. This becomes all the more true as specialization increases, and as more scientists take positions in the smaller firms of industry. The university scientist is rarely cut off from contacts with other scientists; and the scientist in a large firm's service is seldom isolated. In the past ten years or so the specialized group system has been much developed as the *modus operandi* for arranging meetings. Unless papers are read at meetings, groups are merely linked by postal service and occasional committee meetings. From this point of view, it is possible to argue that at most meetings the paper itself has a secondary significance. Exaggerate the argument and the conclusion is that the paper is an excuse, a means to another end.

Many diligent supporters of meetings will resent this last comment. That its germ of truth has been falsified by hyperbole cannot be denied. Yet it is not entirely unsupported by practical experience. A fair proportion of papers read at meetings are so badly presented, often with the poorest audibility, that any realist must indeed suppose that the paper hardly matters. Another type of paper that lends truth to this theme is the 'eminent authority' paper, the 'survey-of-a-field' paper which in candid truth advances nothing new and largely or wholly re-presents developments that are well known. Sometimes these papers can be brilliantly stimulative, but in a number of cases, if the glamour of reputation is pushed aside, they are very humdrum affairs. It would be invidious and unkind to cite examples. However, it is perhaps worthwhile enough that scientists, especially younger scientists or those whose work keeps them in provincial regions, should be able to meet eminent veterans.

These criticisms are not made to establish a case for reducing the number of

meetings or for abolishing the ancient custom altogether. They are presented as a plea for better papers, and particularly for a much better standard of oral presentation. Much has been written about scientists' failings in literary presentation, in expressing themselves in typed reports or printed papers. Much less is said about their faults as public speakers, yet who will in honesty not admit that many a meeting is almost an ordeal? For reading papers many are chosen, but the percentage of success is low. Contemporary science, and perhaps chemistry especially, sets a dilemma—new developments are rarely devoid of interest, but they are also rarely free from complexity. There is, too, an age-old dilemma—a paper that is presented at the pace of exposition suitable for print is not also suitable in pace for oral delivery. The listening mind cannot absorb stage-by-stage reasoning as easily and accurately as the reading mind. The mind, when assimilating print, can always 're-cap.', but any attempt to remember some previous point when listening to a paper means that further points are missed.

The version of a paper that is read at a meeting must be simpler than the version intended for subsequent presentation; alternatively, the paper, as intended for print, should have been circulated as a pre-print or at least as a generous abstract a few days before the meeting. Only by one or other of these methods can the reader hope to ensure that his audience is kept with him from start to finish. Ideally, both methods should be combined—the pre-print should be circulated and the presenter of the paper should not read its text verbatim, but instead should give an *extempore* commentary. However, this advice cannot always be followed. Considerable confidence and experience is needed for the successful extempore effort, and it is better not attempted when there is any risk of failure; bad efforts of this kind can be the most incoherent of all. Secondly, when a paper is read by a scientist in an authoritative official position, or in an important industrial position, the extempore approach may be dangerous, leading to misinterpretations of policy or divulgences of confidential information.

However, these are finer points of paper presentation. More papers are bad because elementary requirements are ignored. All too frequently the speaker seems never to have timed his paper. He finds it taking too long both for his own and the audience's patience and during the second half he either risks making emergency cuts or increasing the rate of delivery. The latter course is often adopted by a speaker who in any case is not particularly audible. Inaudibility is a common failing. Must scientific humility be so often associated with a fear of raising the voice? When a text is being read verbatim, must the eyes—and therefore the mouth as well—perpetually be directed downwards. The reading of a text should be well rehearsed if only to achieve sufficient familiarity with it to enable the eyes to leave the paper frequently. Nor should presenters of papers forget that the acoustics of many lecture-rooms or halls leave much to be desired. The microphone has undoubtedly invaded scientific meetings, but it is often an unfamiliar aid to the speaker, and sometimes it is inefficient in performance. It is far better to aim at speaking well without a microphone.

Another common fault which could so easily be avoided is the slipshod handling of lighting when slides are used for diagrams or pictures. How often when a complex paper is being read and when an audience requires both ears and the preprint to keep up with the argument, the speaker forgets to tap his pointer as a signal to restore lighting after a slide has been shown. He has his own light illuminating the pages of the paper and he forgets his audience is still in darkness—or he assumes it does not matter as there is another slide to be shown in five minutes.

If this mixture of comment stirs the consciences of scientists now committed to present papers at future meetings, it can perhaps assist the cause of better papers, and in turn the cause of better attendances at scientific meetings. Clarity is the duty of any scientist with something to say. Clarity on paper is slowly improving—between MS preparation and final print, it can in any case be fostered by advice and wise editing. Clarity at the rostrum seems far more elusive.

Notes & Comments

Waste Recoveries

OUR recent comments upon the DSIR Report for 1954-55 (see THE CHEMICAL AGE, 1956, **74,** 729-730) left no room for detailed references, but one development, somewhat tucked away in the report from the Intelligence and Information Division, was most reluctantly not mentioned. It is this section of the DSIR which is interested in recovery of industry's waste materials, an aspect of its work which might not be readily realized from the section's name. Two examples are discussed in the report. A survey of end uses of sulphuric acid revealed that very large quantities of ferrous sulphate in an excess of sulphuric acid were being discharged to sea; the suggestion was made (by an officer of the Division) that this material could be treated with ammoniacal liquor from gas works to produce ammonium sulphate (fertilizer) and hydrated iron oxide (for coal gas purification). Successful pilot plant runs by the gas industry have led to the erection of a full scale plant; the Gas Council expects some 10,000 tons of ferrous sulphate to be recovered as iron oxide and ammonium sulphate. The iron oxide will be mixed with peat and used for sulphur extraction, and will save on imports of bog iron ore now used for the same purpose. Also, the amount of sulphuric acid used by the gas industry in making by-product ammonium sulphate will be reduced.

Overspray

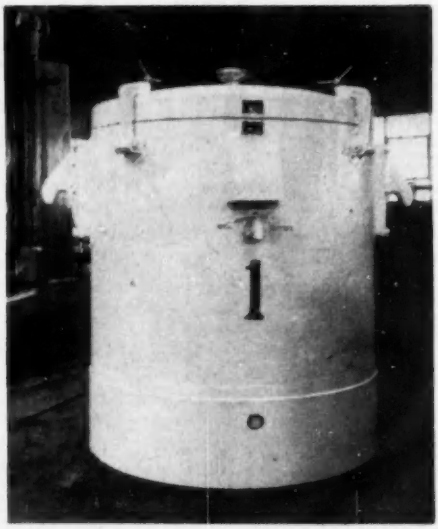
THE other example concerns the wastage of paint in overspray from the spray booths of car and domestic appliance manufacturers. Here knowledge from other countries where this type of recovery has already been attempted has been the *modus operandi* for British effort. As a result, one of the largest car manufacturers here has now arranged to sell back the overspray waste to a paint company, which reprocesses it and then resells it to the car company for re-use. Obviously the DSIR, and particularly this active section of it, are to be commended for stimulating these waste recovery schemes, but comment would be incomplete if it did not include some expression of surprise that industry has needed to be prompted into developing these processes of salvage. Should such regular and large-scale wastes have been tolerated without thoroughly examining the possibilities of recovery? The bigger the works or factory, the greater the amount of waste and the more obvious the opportunity. Enterprise is less than it claims to be when outside intervention of this kind is needed to turn running wastes into useful assets.

Indian N-P Fertilizer

AN interesting new fertilizer process, developed and patented by National Chemical Laboratory of Indian workers, has been described in India's *Journal of Scientific & Industrial Research* (1956, **15A,** 82). The need for cheap and abundant fertilizers in India has been emphasized by the Planning Commission's recommendation that without any delay 200,000 tons of phosphatic fertilizer per annum should be produced. This is more than twice India's present output of superphosphate. The Commission's longer-term target is 250,000 tons. This would create a demand for some 183,000 tons of sulphur, about three times the present amount imported. An interesting approach without adding to sulphur import needs is to use hydrochloric acid, available as cheap by-product, and ammonium sulphate, available *via* the anhydrite process. Rock phosphate is added to hydrochloric acid, with addition of sulphate of ammonia, and a free-flowing N-P fertilizer is obtained. Samples made have had 15 per cent total phosphate acid and 7.4 per cent nitrogen. The 15 per cent phosphate acid content is comprised of 9.3 per cent water-soluble, 4.1 per cent citrate-soluble, and the rest non-soluble. A three weeks' curing time appears to be essential.

Only Slightly Inferior

TESTS have shown this fertilizer to be only slightly inferior to an equivalent N-P mixture of superphosphate and sulphate of ammonia, and this is not regarded as a significant drawback as the fertilizer has a neutral character. The role of the added sulphate of ammonia is, of course, similar to its role in nitrophosphate processes—in this case, calcium chloride is converted into calcium sulphate and ammonia chloride, just as calcium nitrate in nitrophosphate production is converted into ammonium nitrate and calcium sulphate. The objectional presence of calcium chloride is thus avoided. Whether this route to available phosphate without using sulphur is preferable to using anhydrite for initial sulphuric acid production is open to debate. Presumably it is attractive in India since sulphate of ammonia is already being made from anhydrite whereas the acid process would have to be initiated.



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Paper & Prevarication

'I AM tired of listening to politicians exhorting us to export without any suggestion of how to do it,' declared Sir Graham Cunningham, chairman of QVF Ltd., at a conference at Droitwich on 23 March.

Sir Graham observed that half the world was behind the Iron Curtain 'and of the remaining half which is supposed to be available for our trade, much of South Africa is in revolutionary torment, India is tricky, to say the least, and Egypt and Greece are unfriendly.

'Then to that,' said Sir Graham, 'the appalling restrictions on travel with visas and permits, the paper and prevarication, the bother with the bureaucrats, and the curious complications of currency to confound the conscientious, and you have a glimpse of what a manufacturer has to consider when the politicians tell him to export more.'

Sir Graham was opening a two-day conference arranged by the British Institute of Management.

British Plastics Federation

SPEAKING at the recent annual general meeting of the British Plastics Federation Mr. W. Charles Waghorne, president for the year 1955-56, referred to the technical work carried out by 36 committees and sub-committees. During the past year, he said, the British Plastics Federation collaborated with the British Standards Institution in the making and revising of 22 British Standards for plastics materials and articles made of plastics, and the Federation was represented on 87 BSI committees.

Commenting on the criticism which has sometimes been directed at the Federation's activities, Mr. Waghorne said it was apparent that the Federation could be run on very simple lines if it was considered advisable to curtail the varying activities published in the annual report. But in a growing industry, he added, this would be considered a retrograde step. Membership of the Federation had reached 300, a figure which represented almost 100 per cent of those interested in the plastics industry.

Notes on Textile Microtechnique for the Industrial Chemist

by S. M. CHARLETT, F.R.M.S.

IN a previous article (see THE CHEMICAL AGE, 1955, **73**, 1049) the writer discussed some of the methods applicable to the microscopical examination of paper fibres. As well as paper, the industrial chemist may often be called upon to examine various textile fibres in any one of their many industrial forms. Some of the methods used in the examination of such fibres are similar to those applied to paper, but many of them are entirely different, and in this article it is hoped to outline some of the more useful of these techniques.

As in the examination of paper, it is often useful to separate the individual component fibres of a sample under examination, prior to its preparation for the microscope. The technique employed by Lasse (**1**) was referred to in an earlier article by the writer, and it may be of interest to recapitulate the main points here. The method is quite simple and can prove very useful in even semi-skilled hands, provided the steps are laid down, and the liquids used are specified. The writer has found the following procedure simple enough to be followed by technicians whose contact with this sort of work is only spasmodic:—

(1) Cut a specimen of the material under examination, about 2 cm. square.

(2) Separate the fibres as much as possible by gentle teasing with a histological needle, taking care not to use force enough to cause damage to individuals.

(3) Place the teased sample in a glass stoppered cylinder, and add 10-15 ml. of a liquid of the required density.

(4) Insert the stopper and shake the cylinder vigorously for about five minutes.

(5) Allow the cylinder to stand in a warm place (37°C incubator) for about 10 minutes, when the fibres will have separated into layers, at various levels according to their relative densities.

(6) The separated fibres may then be removed by decanting, and then treated by staining or otherwise for microscopical examination.

The technique is of wide application, and has been found to be very successful. The liquids more commonly used are listed below, together with their densities:—

Liquid	*Density*
Acetone	1.0280
Benzene	0.8784
Chloroform	1.4989
Carbon tetrachloride	1.5936
Ethyl alcohol	0.7936
Liquid paraffin	0.8280
Methyl alcohol	0.7958
Propyl alcohol	0.8040
Water	1.0000
Xylene	0.8811

As a complement to the above table, the table below lists the densities of some of the more common textile fibres which have been treated by this method:—

Fibre	*Density*
Plant fibres (Ave.)	1.5000
Cotton fibres	1.48–1.56
Silk fibres	1.3700
Wool fibres	1.26–1.34
Linen fibres	1.4600
Viscose rayon fibres	1.42–1.53
Acetate rayon fibres	1.25–1.33
Cuprammonium rayon fibres	1.5200

A study of the above technique will show that careful selection of the liquid used is necessary in view of the fact that there may be some solvent action upon the fibres being treated. This raises a point which was partially used by Kirret (**2**) who devised a technique for the separation of cotton from viscose. In this the following steps were used:—

(1) A small portion of the sample, 2-3 cm. square, is extracted with carbon tetrachloride for 10 minutes, and then transferred to a beaker containing dilute nitric acid at about 70°C for 15 minutes. This will remove resins.

(2) Aniline dyes, if present, are removed by immersing three times in 0.06 per cent potassium permanganate, and 0.5 per cent oxalic acid alternately.

(3) The resin and dye free specimen is then transferred to a boiling tube containing 30 ml. zincate* reagent plus 30 ml. of distilled water. This is then raised to 30°C for one hour, with frequent shaking.

(4) The tube is then allowed to cool, and the contents tipped on to a sintered glass filter. The residue, which consists of cotton

** Zincate reagent may be prepared by dissolving 150 g. of zinc oxide in 400 ml. of 75 per cent sodium hydroxide, diluting to 1 litre, filtering, and storing in dark glass.*

fibres, is then washed with the following series of liquids:—

(a) 25 ml. of zincate reagent mixed with 25 ml. of water.
(b) 30 ml. 3N sodium hydroxide.
(c) 100 ml. cold distilled water.
(d) 200 ml. N/5 hydrochloric acid.
(e) 1 litre hot distilled water (90°C).
(f) 100 ml. methylated spirits.
(g) 50 ml. fresh methylated spirits.

(5) The washed cotton residue is then allowed to dry at 80°C for 30 minutes, and the fibres may then be treated by any of the staining or other methods to be outlined below.

The initial separation of the fibres having been completed by one of the above techniques, preparation may now proceed for microscopical examination. As in the case of paper fibres, the methods used for textiles may be divided into temporary preparations and permanent preparations. Under the heading of temporary preparations will be included some microscopical methods of fibre identification by reaction with certain reagents, as well as identification by staining techniques.

Temporary Microscopical Preparations

(1) *General methods*:—The comparatively simple techniques may be applied to any of the textile fibres, but are more generally employed for the examination of those fibres of animal and vegetable origin rather than the synthetics which will be dealt with later. Generally speaking, the normal histological reagents may be used for the examination of fibres and the two reagents described below have been used for histological preparations with great success for many years.

It is possible to mount a fibre specimen in water and examine it with the microscope, and it is possible to gain some information about the structure of the specimen from such a mount, but the structure of a fibre is best examined after treatment with a clearing agent. The term clearing was discussed in an earlier article, but to briefly recapitulate it means that by treatment with a special agent the fibre is rendered more than usually transparent, thus enabling the internal and external features to be more easily observed. There are a number of such agents available including some of organic origin such as xylene and benzene. The disadvantage with these is the rapid rate of evaporation, rendering any prolonged examination of the specimen impossible.

To avoid this disadvantage many workers use a lacto-picro-phenol combination which gives excellent results, producing clear structural differentiation. The general formula for this reagent is:—

Lactic acid BP	40.0 ml.
Saturated aqueous picric acid	20.0 ml.
Phenol crystals BP	40.0 g.
Distilled water	20.0 ml.

Dissolve the phenol in the water using gentle heat if necessary. Add to the lactic acid and finally add the picric acid solution. Allow to stand for 12-18 hours, filter, store in a glass container. The stopper should be well greased as traces of the reagent can cause firm adhesion of the stopper to the neck of the bottle.

The technique with this reagent is quite simple. A small quantity of the fibres being examined are teased out with histological needles at the centre of a clean microscope slide, and two drops of the clearing agent added. The preparation is then covered with a cover glass and allowed to stand for 10-15 minutes. Subsequent examination under the microscope will reveal the fibres to have been rendered semi-transparent, and it will be seen that the details of structure have been greatly enhanced. The writer found that the main disadvantage with this reagent was a slight tendency to lose water by evaporation. This could be prevented by the use of glycerine, and the following formula was devised:—

Lactic acid BP	30.0 ml.
Saturated aqueous picric acid	15.0 ml.
Phenol crystals BP	30.0 g.
Glycerine	70.0 ml.
Distilled water	10.0 ml.

Prepare as for the original reagent, adding the glycerine last, and store in a glass container. The difficulty concerning adhesion of the stopper is largely obviated, unless the reagent is not used for very long periods.

The technique for using this reagent is the same as for the original, and the preparations may be kept for quite long periods, very little drying out taking place. It has the added advantage of being suitable for the preparation of permanent mounts as will be described later.

(2) *Special methods*:—The use of clearing agents is, as was mentioned earlier, largely restricted to the natural fibres, and

the synthetic range of fibres need special treatment for the study of structure. Many methods exist for the differentiation of synthetic fibre structures, but only two are given here, these being the most useful.

Sieborg (3) devised a technique for the study of the supermolecular structure of synthetic fibres, in particular cellulose hydrate, by means of the microscope. The essential steps in the technique are as follows:—

(a) Specimens are freed as far as possible from any extraneous materials.

(b) The separate fibres are soaked in distilled water for 24 hours, at a constant temperature (a 37°C incubator is ideal).

(c) The water is drained off and the specimen treated with a mixture of 50 parts glacial acetic acid and 50 parts acetic anhydride for 10 minutes at room temperature.

(d) The treated fibres are then sectioned* and the sections are mounted in distilled water for microscopical examination.

The sections of fibres so treated are compared with those from normal fibres. In the case of the viscose rayon it will be found that the interior of the fibre is attacked, if the treatment is prolonged. However, the disintegration will rapidly spread throughout the structure and into the outer layers. On the other hand Lanuso, Schwartz, and cuprammonium fibres are attacked at all levels, as will be evidenced by signs of degeneration throughout the section immediately following treatment. Fibres which have been spun from very dilute rayon solutions dissolve rapidly by this technique, and if it is wished to study such fibres the treatment must be shortened. The same thing may happen in badly stretched fibres.

The fibrillar structure of fibres of synthetic origin is often of interest to workers, and methods of study have been devised, the most useful of which appears to be that of Welch *et alia* (4). It this, some of the fibres are placed at the centre of a clean microscope slide and covered with a clean cover glass. A drop of 70 per cent nitric acid is placed at one edge of the cover glass, and will be drawn under it by capillary attraction. Observation of the fibres will show that they rapidly swell, and a very gentle pressure on the top of the cover glass will cause them to disintegrate into fibrils the arrangement of which with regard to the fibrillar axis is quite obvious.

(3) *Staining methods*:—For the examination of materials known to be composed of linen, wool, silk or cotton, the writer finds the following formulæ of value as a differential stain:—

Acid fuchsin	8.0 g.
Aniline blue	12.0 g.
Tannic acid	12.0 g.
Saturated aqueous picric acid	1.0 Litre

Dissolve the tannic acid and dyes in 500 ml. of the picric acid solution using gentle heat if necessary, add the remaining picric acid solution and filter.

The method employed with this reagent is as follows:—

The fibres to be treated are placed at the centre of a clean microscope slide, and two drops of the stain are applied for four minutes. Excess stain is then drained off, the treated fibres are washed with distilled water until colour ceases to come away, and then allowed to air dry. A drop of fresh distilled water is placed on the fibres and the preparation then covered with a clean cover glass. When examined under the microscope the following reactions will be observed in the presence of the appropriate fibres:—

Linen	Pale blue
Cotton	Pale blue
Wool	Bright yellow
Silk (Raw)	Brown
Silk (Degummed)	Dark brown

Bast fibres, if treated with two per cent aqueous solution of zinc chloride for 10 minutes, well washed with distilled water, and then treated with a one per cent aqueous solution of gold chloride for 10 minutes, will reveal upon microscopical examination a deeply stained brown centre portion and an unstained cell wall.

The staining of synthetic fibres is probably more important than that of the natural types, for the simple reason that the former are so often similar in appearance and have no histological characters which may be interpreted by the observer, and staining is one of the few ways of differentiation.

The American Bureau of Standards invesitgated the problem and in 1939

** The term 'sectioned' is used to describe the cutting of extremely thin slices of the material being examined, using a special instrument known as a 'microtome' or freehand using a razor. It is hoped to deal with the sectioning of fibres in a separate article in the future.*

recommended the two following formulæ for differential staining of synthetic fibres:—

(a) Picric acid one per cent aqueous containing 0.2 per cent soluble blue 2X.

(b) Tannic acid one per cent aqueous containing 0.2 per cent soluble blue 2X, and 0.1 per cent eosin.

In using either of these stains the prepared fibres are treated with the selected reagent for five minutes, rinsed with distilled water until colour ceases to come away, and then mounted on a clean microscope slide in distilled water. The results with the various rayons are as below:—

Formula	*Viscose*	*Cuprammonium*	*Acetate*	*Nitrocellulose*
(a)	Pale blue	Deep blue	Bright yellow	Colourless
(b)	Lavender	Lavender	Colourless	Deep blue

The writer has found that whilst these stains are very useful, they do tend to vary somewhat in their results. Additionally the stains themselves are not readily available in this country. In view of this the writer has used the formula referred to at the beginning of this section as a stain for natural fibres, as a differential stain for synthetic fibres. Results were quite encouraging, and the following reactions were obtained:—

Nylon	Green yellow
Vinyon	Light blue
Viscose	Pale red-blue
Cuprammonium	Deep blue

Further samples are being tested as synthetics come to hand.

Other reagents have been used for the differentiation of the synthetic fibres, several of which are given below:—

(1) One per cent aqueous Ruthenium red.
(2) Schultze's Chlor-zinc-iodide. *
(3) Iodine sulphuric acid.*
* *Formulae available in histology books.*

In the case of (1) the fibres should be stained by the usual techniques, but in the case of (2) and (3) a different method must be used. With both the latter a small portion of the fibres under examination is teased out at the centre of a clean slide, a drop of the selected reagent is added, and the preparation covered with a clean cover glass. After a few minutes the following reactions will have taken place in the presence of the particular fibres mentioned:—

Formula	*Acetate*	*Nitrate*	*Cuprammonium*	*Viscose*
(1)	No colour	Violet	Pink	Pink
(2)	Yellow	Red-violet	Brown	Blue-green
(3)	Yellow	Violet	Pale blue	Blue

Obviously the identification of fibres, when alone or present in a mixture, may be performed by the use of a selective or differential stain such as are described above. It will be noted, however, that the first stain referred to in the previous section produces a blue colouration in both cotton and linen fibres. Now although these are distinguishable under the microscope by the experienced observer such differentiation is quite difficult, and it may be rendered more simply performed by the use of the following technique which is not a stain but a chemical reaction producing a staining effect:—

Reagents:—(1) Five per cent aqueous ortho - hydroxy - quinoline sulphate.

(2) Five per cent aqueous solution of sodium carbonate.

Soak the unknown fibres in the first solution for 10 minutes at about 40°C, rinse for five minutes in distilled water and soak in the second of the solutions for 10 minutes.

The treated fibres may then be examined microscopically or macroscopically by ultra-violet light. Fibres fluorescing with a canary yellow tint are linen, and those which are not fluorescent but have a deep violet tint are cotton. The treatment does not produce a reaction in the synthetic fibres. If the examination is microscopic the instrument must be equipped with an ultra-violet light filter, to avoid any damage to the operator's eyes. It is hoped to discuss this point in a later article.

The microscopical identification of fibres is possible by the interpretation of reactions produced by selected reagents. This type of technique is only applicable to the synthetics, although there are a few natural fibres which can be detected in such a way. The different rayons may be identified by the reactions outlined below.

As has already been mentioned, identification of fibres may be carried out by staining and non-staining methods, and it is obvious that these may well be extended to the detection of adulterants in a fibre mixture. In addition, several special methods have been devised for the express purpose of detecting adulterants. Haller (1943) devised a technique for the detection of cottonized bast fibres in textile samples. It is well known that bast fibres may be treated in such a way as to resemble true

Reagent	*Acetate*	*Nitrocellulose*	*Cuprammonium Glanzdorf*	*Viscose Xanthogenate*
Water.	No change.	Swells.	Swells.	Swells.
Acetic acid.	Dissolves.	No change.	No change.	No change.
Chloroform.	—	—	—	—
Ammoniacal copper oxide.	Swells.	Swells and dissolves slowly.	Swells slowly, dissolves slowly.	Swells and dissolves.
Chromic acid.	Swells.	Dissolves.	Dissolves.	Dissolves.
Diphenylamine.	No colour.	Blue tint.	No colour.	No colour.
Fehlings solution.	Blue.	Green.	Blue.	Blue.
Sulphuric acid.	Dissolves slowly.	Dissolves quickly, yellow solution.	Dissolves slowly, brown solution.	Dissolves quickly, rusty solution.

cotton fibres when examined microscopically. This is usually done by so disintegrating the fibres that the middle lamella is removed without undue damage to the rest of the fibre structure. The ultimate product is virtually indistinguishable from true cotton when the normal microscope methods are employed. Haller, however, found that such differentiation may be made by the following method:—

Reagent:—A two per cent solution of diethylenediamine is saturated with copper hydroxide, filtered, and stored in glass.

The fibres being examined are placed at the centre of a clean slide, two drops of the reagent added, and the mount covered with a clean cover glass. The reaction will be hastened by keeping the slide in a warm place, such as an incubator, for a few minutes. Examination of the preparation at intervals of a few minutes will show that as the water evaporates, the treated fibres begin to swell. Normal cotton fibres swell irregularly whilst cottonized bast fibres swell regularly along their length.

The differentiation of real from synthetic wool fibres is often very difficult by normal microscopy. A simple technique may be employed for this purpose.

Reagents:—One per cent aqueous solution of crystal violet. A few genuine natural wool fibres.

Some of the fibres to be identified are teased out at the centre of a clean microscope slide, and alongside are placed a few of the known fibres. One drop of the dye solution is then added and the preparation covered with a clean cover glass. The slide is immediately observed under the microscope. Unknown fibres which stain more rapidly than the standards may be assumed synthetic, those which stain at the same rate as the standard may be assumed genuine wool fibres.

Nylon fibres in a mixture may be detected by treating the specimen with a one per cent aqueous solution of potassium permanganate for 20 minutes. The treated fibres are then bleached in a one per cent aqueous solution of sodium bisulphite for 20 minutes. If nylon fibres are present, microscopical examination will reveal them as unbleached fibres with a brown tint, all other fibres will be colourless.

The detection and estimation of fibre damage is a subject which could occupy an article of its own, but there is room here to deal very briefly with this aspect of textile microtechnique, and to outline a few of the methods which have been devised for such purposes. The damage may be mechanical, or it may be due to the action of chemicals or light, and the techniques used for the different types of damage vary.

Bright (**5**) devised a staining method for damaged fibres which was modified by Clegg (**6**) for the purpose of examining chemically or mechanically damaged materials. The modified technique is as follows:—

A portion of the material under examination is soaked in a 10 per cent aqueous solution of sodium hydroxide containing one per cent of a wetting agent such as Teepol or Lissapol, for 10 minutes. The specimen is then washed with distilled water until the washings remain colourless with the addition of one drop of phenolpthalein indicator solution. The treated specimen is then immersed in a two per cent aqueous solution of congo red for 10 minutes, washed with distilled water, and then transferred to a solution of sodium hydroxide, the strength of which depends upon the degree of swelling desired as detailed below.

The strength of sodium hydroxide solution depends upon the damage being investigated. A 10 per cent solution will be satisfactory for those fibres which have

been damaged by heat, light, mildew and chemical attack. This will split the cuticle without extensively damaging it by tearing. Slight mechanical damage, in which there is no splitting of the cuticle initially may require more severe treatment, and 18-20 per cent sodium hydroxide may be employed. Where the damage is more severe and the cuticle is affected it is possible to get a reaction with 5-7 per cent solutions.

The usefulness of this technique lies in the indications of damage given by the diffusion of dye into the fibres. The secondary cellulose stains deeply, whilst the cuticle is only lightly stained, and any damage is readily detected.

The above technique can prove very useful, but a simpler and more reliable method of estimating small amounts of mechanical damage was devised by Whewhell and Woods (**7**), and depends on chlorination of the fibres with subsequent staining using methylene blue. The technique is briefly:—

(1) The sample under examination is freed from grease and dirt by extracting with several changes of ether and alcohol.
(2) The treated sample is then transferred to a solution of sodium hypochlorite, of such strength as to contain about 0.12 per cent free chlorine, for 15 minutes. Best results are obtained if the *p*H of the hypochlorite solution is adjusted to about 10.0.
(3) The sample is then washed in running tap water for two minutes.
(4) The treated fibres are then stained with an 0.04 per cent aqueous solution of methylene blue for five minutes, washed free of all colour, and then allowed to air in dry.
(5) The stained material is then teased out at the centre of a clean slide until the individual fibres are well separated, a drop of liquid paraffin added, and the preparation covered with a clean cover glass.
(6) The mounted fibres may then be examined by a lense combination giving about 200 magnifications.

The test is accurate and precise provided due attention is paid to the details. Damage is estimated by the amount of stained area on the fibres. This must to some degree depend on the worker, but with training accurate observations may be obtained. The inventors devised the following fibre gradings for this technique:—

(1) Scale edge only attacked.
(2) Heavy attack on scale edge, but not extending over entire surface.
(3) Staining of entire scales, but edges still well defined.
(4) Heavy damage with obliteration of the fibre outlines.

Harlow (**8**) devised a technique for the examination of damaged fibres which depended on the production of 'ballooning'. 'Ballooning' is the term used to describe the swelling of the fibres by various reagents, and the effect is probably due to variations in the nature of the primary or secondary walls. This does become distorted by various chemicals, and produces a variation in the X-ray pattern of the fibres, bringing out the finer structural details and enhancing signs of any damage present. Harlow recommends the following reagent for use in this technique:—

10 g. of ruthenium red is dissolved 10 ml. of a 50 per cent aqueous solution of trimethyl-benzyl-ammonium hydroxide. The resulting solution is allowed to trickle through wool. The reagent should be freshly made as it tends to fade after 10 or 12 hours.

The fibres to be treated are separated and freed from dyes in the usual manner, and a small portion teased out at the centre of a clean slide. Two drops of the reagent are added and the preparation covered with a clean cover glass. After being allowed to stand for a few minutes the slide may be examined, and it will be found that 'ballooning' has taken place in affected fibres, and that any signs of damage have been considerably enhanced.

Permanent Microscopical Mounts

The methods of making permanent microscopical preparations of textile fibres are similar to those for paper fibres, which were briefly detailed in an earlier article, and it is not proposed to repeat them here. Attention is called however to a medium devised expressly for the permanent mounting of textile fibres by Broadfoot & Schwartz (**9**). This involved the use of a medium originally described by O'Brian & Hance (**10**), isobutyl methacrylate. The refractive index of this medium was originally measured as 1.477, as compared with the 1.535 of Canada balsam and the 1.567 of

[*continued at bottom of page 798*

Indian Newsletter

FROM OUR OWN CORRESPONDENT

IT has been officially announced that broad agreement has been reached between the Government of India and the British Steel Consortium on the setting up of a 1,000,000 ton steel plant at Duragpur, West Bengal. It is learnt that details will be finalized within the next three months. According to the announcement, the plant machinery and a considerable portion of the steel structures, refractories and other materials required for the plant will be supplied by the members of the British Consortium. The foreign exchange cost of the plant, equipment and material is expected to be about Rs 50,000,000 (£3,750,000). The rupee cost of erection will be about Rs 390,000,000 (£29,250,000). A syndicate of British banks has agreed to give credits of £11,500,000 and the UK Government have offered to the Government of India a loan of £15,000,000. Production is expected to commence by the middle of 1959.

* * *

It is learnt that a ferro-manganese factory is being set up at Karividi, 10 miles from Nellimarla in Andhra State. The factory, which is expected to cost Rs 15,000,000 (£1,125,000), will go into production by the middle of 1957. An agreement for the power supply is being finalized at present.

* * *

The Minister for Commerce and Industries of the Hyderabad State Government has announced that a sum of Rs 25,000 has been sanctioned for preparing a report on the proposed fertilizer factory in the State. It is hoped that the fertilizer factory will be established at Kothagudem. The question of obtaining sufficient electric power has been a major bottleneck in the project and now that the Andhra Government has agreed to supply electricity at a cheap rate, the prospects of the factory coming into being shortly are bright. At a recent conference of State Ministers of Agriculture in New Delhi, a recommendation was made for the launching of a concerted campaign in all the States of India for the popularization of nitrogenous and phosphatic fertilizers. The use of new nitrogenous fertilizers with higher nitrogen content and the stepping up of the consumption of superphosphates to maintain soil fertility and ensure quality of grain were stressed.

* * *

The preliminary investigations of the lignite project at Neiveli, Madras, have reached an advanced stage. Fairly large scale trials have been made by the UK consultants who have subsequently drawn up project reports, one of which has been accepted by the Government of India. The final phase of the investigations aims at determining whether the ground water below the lignite belt can be controlled by means of adequate pumping. The boring and casing of the pump wells, observation wells and recorder holes required for the pumping tests have been completed. On the basis of earlier pumping tests experts have calculated that to mine and remove lignite safely from an area corresponding to a mining strip in regular opencut mining, by effecting a local depression of the water pressure, it would be necessary to pump out about 20,000 gallons of water per minute from the water bearing strata below the lignite, over a period of about 100 days. Twenty pumps of a capacity of 1,000 gallons per minute each will handle the final test and went into action on 29 February 1956, for the final check. The final results will be available in June. Meanwhile, initial planning required for implementing the integrated project is in hand so that if pumping tests prove successful, further action in the mining of lignite could be taken up in the least possible time.

The Annamalai University, whose campus lies 22 miles from Neiveli, have undertaken valuable research on diverse aspects of the lignite deposits. Proximate analysis of samples drawn from different depths gives the average values, on air dry basis, of 10.2 per cent moisture, 48.31 per cent volatile, 36.75 per cent fixed carbon, 4.69 per cent ash and 1.41 per cent sulphur with a calorific value of 9,300 BThU. In view of the high volatile content low temperature carbonization of seven samples at 550°C by the Gray-King method has been conducted. The extraction of montan wax, among other by-products, has been studied. The highest

yield was obtained with an azeotropic mixture of benzene and ethyl alcohol. Tests have been conducted as to whether Neiveli clay can be mixed with cement to be used in concrete construction as the heat of hydration will be less. Spectroscopic analysis of lignite specimens has indicated the presence of traces of titanium, uranium, molybdenum, calcium, magnesium and tungsten.

* * *

Indian Explosives Ltd., which was formed as a new company over two years back with the Government of India and Imperial Chemical Industries Ltd. as the prime partners, has made much preliminary progress. According to a recent report, a site of 2,000 acres at Gomia in Bihar has been chosen and ground survey and geological survey have been under progress; buildings are coming up fast. It is hoped that in the next 18 months the transformation of a virgin jungle site to a modern explosives factory will be complete and the first products for use in nearby coalfields of Bengal and Bihar and for other purposes would be ready by the beginning of 1958. It would be interesting to record here that, according to the latest report of the Chief Inspector of Mines of the Government of India, during the year 1952, 2,269,781 lb. of permitted explosives, 1,731,320 lb. of high explosives and 5,438,636 lb. of gunpowder were used at coal mines. In mines other than coal mines, 1,198,713 lb. of gelatine, 1,185,086 lb. of gelignite and 955,310 lb. of gunpowder were used during the same year. The numbers of detonators used in coal mines and other mines stood at 9,119,222 and 8,164,322 respectively for that year. It is hoped that with increasing coal and other mining as well as blasting operations in the country in the immediate years ahead, the amount of all categories of explosives needed would indeed be very great in comparison to current consumption levels.

* * *

The Travancore Rayons Ltd., of Travancore-Cochin State, has embarked on expansion of its activities. The concern which is one of the leading producers in India started production in 1950 with an initial capacity of five tons of rayon yarn and 1.25 tons of transparent cellulose film, known as Trayophane, per day. To meet increasing demands, the installed capacity of rayon yarn has recently been stepped up to seven tons a day and that of Trayophane to five tons a day. A moisture proof plant, to convert part of the Trayophane into a moisture proof, heat-sealing variety, has also been installed. Printing and bag-making machines have been commissioned to make bags plain and with designs. The development programmes in contemplation under the Second Five Year Plan include the installation of six more spinning machines of 1.8 tons per day capacity, a third cellulose film plant of four ton capacity per day and another moisture-proof plant. The plant when fully expanded according to schedule will no doubt render further service in meeting the enhanced needs of industrial India of the future.

* * *

The foundation stone for the Rubber Research Institute was laid by the President of India at Puthupally, near Kottayam, in Travancore-Cochin State. The area represents one of the biggest rubber growing centres in India. The Rubber Research Institute will be located on a hillock on a 77 acre plot. Of the two schemes sanctioned by the Government of India and to be financed by the Rubber Board, one proposes to replant 70,000 acres with high yielding trees over a period of 10 years and the other is the establishment of the Rubber Research Institute with an Experimental Station. It was pointed out that rubber production was not able to catch up with consumption and that all possible measures should be taken to develop the industry.

* * *

In connection with the proposal of the Government of India to start a factory to manufacture all types of photograph films, a team of German experts from Agfa Film Works, Germany, has been touring the country for the selection of a suitable site. It may be remarked that the Government of Mysore had some years back investigated the possibility of setting up such a factory near Mysore. However, the German experts have visited places near Bombay and Poona and in Northern India. Recently they were in Mysore and at Ootacmund to make an exhaustive survey of the potentiality of these areas. It is likely that the environs of Ootacmund may be suitable for the location of the factory in the opinion of the experts. The team has submitted its report to the Government of India who are expected to take a final decision on this project which is estimated to cost Rs 30,000,000 (£2,250,000).

Self-Adhesive Labelling

Uses in the Chemical Industry

THERE are two main types of self-adhesive label, either printed adhesive tapes or self-adhesive labels put up on a suitable backing. Adhesive tapes—in effect self-adhesive labels in roll form—distinguish themselves from the ordinary adhesive label by their attractive appearance, high resistance to abrasion, ability to adhere to unusual surfaces and resistance to weather conditions and many types of solvents and oils. Because of these properties they are useful to the chemical manufacturer not only for normal labelling with brand or manufacturer's name but particularly in meeting the various legal or semi-legal requirements for transport and other authorities.

One to twelve labels, for example, are stipulated for chemicals carried by sea. For rail transport a different set of labels is required; and once again various international bodies such as the International Air Transport Association, have worked out specific labelling schemes. Fresh developments in this field are likely.

Spoil Appearance

Large drums are generally given a first-class appearance by lithography, and older methods of marking such as paper labels or stencilling can completely spoil the appearance of the container. Printed self-adhesive label-tapes, having a naturally glossy appearance, blend well with lithographed surfaces, and are less easily soiled or defaced.

Many chemical products are packed in 40/45 gallon drums, which are usually stacked vertically. Inevitably loaders walk on these drums and markings are removed or defaced. Printed self-adhesive label-tapes are said to be resistant to this form of defacing.

Where unusual containers such as polythene, gutta percha or wax bottles have to be labelled, self-label-tapes give both speed in application and first-rate appearance.

The destructive effect on normal markings of many chemical products led one company, Industrial Tapes Ltd. of London, to develop in conjunction with leading firms in the industry, a series of label-tapes with a permanent transparent screen laminated over the printed surface. Various types are now made which withstand the action of a wide range of solvents, oils etc. The labels need no drying, and containers can be filled immediately after labelling.

In considering the cost of printed adhesive tape-labelling several factors enter apart from the unit cost per label. Even unskilled labour is expensive, and the packaging department needs to consider:—

(1) Speed of application.
(2) Space taken up in applying markings.
(3) Space occupied by pre-marked packages.
(4) Amount of ancillary material required.

Self-adhesive tape-labels offer considerable advantages in most of these respects, and it has been found that operating economies invariably more than counter-balance any price differential between the new form of tape-labelling and older methods.

Consideration of these factors led one company, British Industrial Solvents, a division of The Distillers Co. Ltd., to introduce self-

This dispenser carries gross tare and net weight labels in roll form to provide for a range of tare weights from 87-110 lb at 1 lb intervals

adhesive tape-labels for standardized barrel marking. Previously, each barrel was weighed and filling was carried out after calculating the difference between gross weight and tare. Ten tape strips were printed to cover 10 tare weights (91-101 lb.), the remaining figures, net and gross weight being preprinted on the tape-label. Thus the barrel weigher simply selects by number a label-tape corresponding to the tare weight; the barlrel is labelled and passed to the filler who reads off the net weight and fills accordingly. No calculation is required on the filling floor, and errors are eliminated.

The standard warning labels fostered by the Association of British Chemical Manufacturers for the marking of containers of hazardous chemicals make use of a standard label closely specified as to over-all size, type size and general layout. Its purpose is to protect all handlers from fillers to users. The scheme has the backing of HM Chief Inspector of Factories. The label has to be in black and white, and many of these are now attractively produced in self-adhesive label-tapes, in many cases with an additional printing for the characteristic house mark or brand name.

The initiative of the ABCM in devising a safety labelling scheme promises to bear fruit internationally in the near future, and discussions are being held with UN International Labour Office to establish an international standard for safety labelling. It is thought that the various properties of self-adhesive label-tapes which have been dealt with in this article will provide a means for implementing any standard scheme which gains international acceptance.

All-glass Smoking Machine

AN all-glass smoking machine which tests the efficiency of cigarette filters in retaining nicotine and tars has been produced by Quickfit & Quartz Ltd., of Stone (Staffs) to the order of Cigarette Components Ltd., London EC1.

Smoke is drawn from the cigarette through an absorption flask whose contents are afterwards analysed.

Taking the place of human lungs is a falling column of water which creates the necessary suction, giving a controlled air flow and constant volume of air.

Water is admitted to an inverted U-shaped burette from a constant-level chamber. When a specially-made three-way tap is in the 'smoking' position, water flows from the burette, drawing an equal volume of air through the cigarette and absorption flask.

The apparatus is being used by cigarette manufacturers in Turkey, Iraq, the US, South Africa, the UK and other countries.

Pollution Trial by Jury

PROPRIETORS of 13 fishings on the River Teviot between Hawick and Ancrum, have taken action against the Scottish Gas Board, for the poisoning of fish by chemicals from the Hawick Gas Works. Lord Hill Watson, who heard the preliminary debate, has granted the pursuers trial by jury. The claim is a cumulative one totalling £2,100 and alleges damage to fishing interests in the section. The Gas Board denies the allegation.

The case is interesting in that it raises a question whether it is illegal to cause pollution of a river by two unconnected acts, each of which in itself is claimed to be legal. The Gas Board disposed of ammoniacal liquor into a deep disused well, but in August 1952, during the digging of a new gas main, the liquor seeped into the river and continued to do so for thirteen days.

Textile Microtechnique

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Clarite. This value was rather low but these workers found that by adding varying quantities of a platicizing agent, namely Arochlor 1242, to a xylene solution of the plastic, the refractive index could be adjusted to the desired value. The technique for this agent is the same as for the other plastic mountants such as Clarite.

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Toluene, Benzene & Nicotine as Industrial Hazards

by HENRY ALLEN

AS laboratory and industrial hazards both benzene and the rather less toxic toluene have had considerable attention. Chronic benzene poisoning being a prescribed industrial disease, managements where the volatile, highly inflammable and highly toxic solvent is used are well versed in its potential menaces. But there is little doubt that much wider use would be made of benzene, if maximally effective codes could be defined to control its hazards and while the search for more and better safety measures goes on, increasing reliance is being placed on toluene.

That, at present, is perhaps the first rule with benzene—to avoid using it whenever a less toxic solvent suited to the technical process is equally effective. Substitution should always be considered, and it has been found possible in industry far more frequently than would be thought likely from the technical objections. Toluene, naphtha, xylene, benzine, methylene chloride etc., are all alternatives. Where benzene must be used, the detailed precautions must be iron strong in observance.

Inhalation of Vapour

Although absorption of benzene can occur through the skin or stomach, inhalation of vapour provides virtually the only significant industrial hazards. As with most volatile solvents, its dangers are chiefly confined to circumstances where the liquid vaporizes into atmosphere. Such a chain of circumstances can be induced by high temperatures, produced by hot work processes, hot surfaces, summer weather, over-warm buildings. It is unlikely to occur with enclosed extraction processes, for example, but is a constant risk where liquid benzene is used for swabbing or in open extraction processes, or where maintenance operations are carried out on plant, or in emergencies such as plant breakdowns and equipment leaks.

It is more likely to occur in batch processes than continuous processes. And it must be anticipated where benzene is stored in ill ventilated premises or where drums are carelessly tapped or run off in enclosed space. It can occur from persistent benzene contamination of clothing, or gloves, during direct handling exposures, or from negligent disposal of process wastes or drainings from extraction processes, especially if in open-topped containers.

Most authorities recommend that the maximum allowable concentration for benzene in the atmosphere is between 35 and 100 ppm. There is evidence that 100 ppm may be just unsafe for prolonged exposures, and it is therefore advisable to accept the MAC for benzene as 50 ppm or 150 mg. per cubic metre.

Simplest Method

At the level of 50 ppm there is no irritation of the eyes or nose. The simplest detection method relies upon the production of an orange brown coloration in a mixture of sulphuric acid and formaldehyde when even traces of benzene are drawn through the mixture. The test is reasonably quantitative down to but not below 100 ppm (0.32 mg. per litre). Several methods are available for the more precise determination of benzene concentrations in air, most of them demanding prior conversion to dinitrobenzene, followed by colorimetric comparisons, after conversion of the dinitrobenzene to one or other coloured derivatives.

Benzene is a moderate skin irritant. Liquid benzene in prolonged contact with the skin will often cause blistering. Splashes in the eye are painful but not seriously damaging to the eye structure. In the Prescribed Diseases under the Industrial Injuries Act poisoning by benzene or a homologue is scheduled as an occupational disease where it occurs 'from the use of or handling of, or exposure to the fumes of, vapour containing benzene or any of its homologues'.

Most commercial toluenes contain a certain amount of benzene, but the physical properties of toluene differ from those of

benzene in showing a much lower vapour pressure, a decreased range of explosive limits, a higher flash point and a lower volatility. From the point of view of safety these are significant differences.

Toluene is far less hazardous than benzene. Chronic industrial poisoning by toluene is rare. Similarly xylene, another homologue, has a record of no chronic industrial poisonings. The maximum allowable concentration (MAC) for pure toluene is notably higher than that for benzene and in many quarters 200 ppm (0.9 mg. per litre) is accepted. The MAC for xylene is also accepted as 200 ppm. Nevertheless for really safe working 200 ppm must be suspect as exposure at such high levels for eight hours has been known to cause fatigue.

The tendency for commercial toluene to contain a proportion of benzene increases the need for care over the MAC. It is advisable that workers exposed to either benzene or toluene at concentrations approximating to the MCAs recommended should undergo periodic blood examinations. Periodic determination of the atmospheric concentrations is of course a necessity.

Whenever a chemical begins to come more widely into use, with the rapid development of new techniques and materials, that is the time for a comprehensive assessment of its potential hazards, and a definition of the safe working codes involved.

Increasing Applications

Nicotine, for instance, is a chemical in increasing application. It can be dangerous; as certainly it can be completely safe in use. Its hazards are well enough known, but are worth reviewing so that they can be precisely located. Nicotine is extremely toxic, and its action is as rapid as that of, for instance, hydrocyanic acid. One to four drops of concentrated nicotine can be fatal if taken through the mouth or into the bloodstream through cuts or abrasions. Poisoning will occur if the chemical is swallowed, absorbed through the skin, introduced through wounds, absorbed through the eye, or inhaled.

Such a list is formidable but the precautions which control all hazards are clear enough. Masks and gloves must be worn whenever concentrated nicotine is handled. Clothing splashed with nicotine must be removed instantly and washed. All containers must be completely sealed and cleaned on the outside before they are loaded.

All operators called upon to handle nicotine must obviously be instructed in its hazardous propensities. Such an employee training code does well to include detailed instruction in the measures to be taken in the event of accidents with nicotine. Immediate first aid measures may make all the difference. Expert medical aid must follow as quickly as possible.

Such clear evaluation of the hazards and enunciation of precautions is imperative if nicotine is to be used in complete safety and without jeopardy to health, as it assuredly can be.

Proposed Special Regulations

THE Minister of Labour & National Service, Mr. Iain Macleod, proposes to make special regulations for the fencing of abrasive wheels in factories and works covered by the Factories Acts. The proposed regulations will lay down standards of fencing of abrasive wheels modifying the existing statutory provisions for the secure fencing of dangerous parts of machinery.

Copies of the draft regulations, 'The Fencing of Abrasive Wheels Special Regulations 1956', may be obtained from HM Stationery Office (price 2d).

Objections to the draft regulations by or on behalf of persons affected must be sent to the Minister on or before 7 May 1956 in writing and must state the specific grounds of objection and the omissions, additions or modifications asked for. Objections should be addressed to the Secretary, Ministry of Labour & National Service, 19 St. James's Square, London SW1.

Gear Exhibition

PART of the collection illustrating mechanical power transmission now on view in Gallery 3 of the Science Museum includes original models and illustrations of gears, bearings, chain-drives and couplings which show the historical development from classical times to the present. The exhibition shows how gears were used on water-raising machines and water-clocks; how they were studied by mathematicians in the seventeenth century, and how they were developed in the eighteenth and nineteenth centuries with the spread of machines and manufacturing methods.

Safety Notebook

A NEW fire detecting system claimed to be so sensitive that it can be made to operate by a breath of warm air or a puff of cigarette smoke is to be demonstrated at The Factory Equipment Exhibition (Earls Court, London, 9-14 April) by The Pyrene Co. Ltd.

The system will form part of a display of modern fire protection equipment designed by The Pyrene Company. It can be set to operate at any pre-determined temperature and gives automatic and instantaneous warning of any abnormal rise in temperature by converting electrical impulses from the fire detector heads into visual and audible alarm signals. Once the fire has been detected, automatic fire extinguishing systems can be brought into action to smother the flames. A further development which transmits immediate fire alarm or fault signals by telephone lines to remote control centres or municipal fire stations, will also be demonstrated. A continuously maintained storage battery enables both these systems to continue functioning for up to 60 hours in the event of a breakdown of mains supply.

Pyrene fire fighting appliances to be displayed include the new PD5 pressure-operated extinguisher which is charged with five pounds of special dry-chemical powder and has been designed to smother small outbreaks of fire involving petrol, oil, spirits, solvents and other inflammable liquids. This extinguisher weighs less than 10 pounds when fully charged.

Of particular interest to industries where large quantities of inflammable liquids are used or stored is the Pyrene FB5X foam-making branchpipe. The FB5X effects a reduction of 50 per cent in both the weight and size of its forerunner, the FB2 model. Weighing only six pounds and measuring 18 in. in length, the new branchpipe has a foam output of 500 gpm using only two gallons of foam compounds and 50 gallons of water at a pressure of 100 pounds per sq. in. Its foam jet is claimed to reach as far as 50 ft.

CELLULUBE fire resistant synthetic oils have been developed by the Celanese Corporation of America to minimize the threat of fire and explosion inherent in many industrial operations. They are claimed to be suitable as power transfer fluids in die-casting and other hydraulic operations and as cylinder lubricants in air compressor systems where they prevent the formation of excessive carbons deposits, and hence reduce the danger of fire and explosion.

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BERYLLIUM poisoning was the verdict returned at a Newcastle upon Tyne inquest on 15 March on a woman research worker, Mrs. Agnes Joyce Atkinson, who died on 12 January. After the inquest the pathologist said it was now thought that there had been two or three deaths in this country, including two at Harwell, from berylliosis, but he thought that this was the first case in which berylliosis would be recorded as the cause of death.

Mrs. Atkinson had been in charge of a laboratory at Spennymoor, County Durham, where the work involved research with zinc beryllium silicate. In September 1950 she became ill and it was subsequently decided that she was suffering from beryllium poisoning. Last May she had a baby without complications, but she became ill again last November.

The pathologist told the coroner that he had found evidence of grave destruction and cyst formation in Mrs. Atkinson's lungs. There were spots of granular degeneration in which there were small crystals of beryllium.

'It is an unusual condition, and it is caused by the patient becoming sensitive to the foreign material. Once that happens the destructive process carries on inexorably', he added.

Beryllium poisoning was first recognized as an industrial hazard in the US about 1940 said the pathologist. By 1949 the hazard had become so well recognized that the fluorescent lamp manufacturers in the US decided not to use the material any longer.

Some people, he continued, could have a very large amount of beryllium and suffer very little. It was the odd case where the patient became allergic that the process went on.

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A CHARGEHAND in the plating shop of the John Bull Rubber Company said at a Leicester inquest on 13 March that he was overcome by fumes to such an extent that he was incapable of warning 20 men under his charge of the danger. The inquest was on a 33-years-old plating plant operative who died on the floor of the factory through inhaling cyanide vapour. The jury returned a verdict of accidental death and added a rider that in their opinion there should be stricter supervision in the draining off of chemicals.

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THE accident frequency rate for ICI's Nobel division in February was 0.410, only slightly higher than the best ever figure of 0.375 returned in January. The previous best figure for the division was 0.433 for August 1955.

Over the six months July 1955 till the end of February 1956 the frequency rate was 0.854, an improvement of 27 per cent over the division's previous best six months' figures, 1.170.

During February there were eight lost time injury cases, six men and two women, but none of these injuries was serious. For the second month in succession no woman sustained a lost time accident at Ardeer.

* * *

PROTECTIVE clothing made by Timeg Ltd. will be on show at the National Industries Textiles Trade Fair Exhibition (Royal Albert Hall, 23-27 April). Prominent on the stand will be two recently developed boiler suits made from Terylene and neoprene. They are claimed to be virtually unaffected by chemical attack, light in weight, comfortable to wear, shape retaining, shrink proof and easy to launder.

Other developments to be shown will include garments designed to protect the body from acids, oils, chemical fumes, petrol and radio active dust.

Flexibox Film

'PUMPS Without Tears', a film made to show the advantages of the Flexibox mechanical seal was given its London premiere on Friday 23 March. The Flexibox mechanical seal is a device designed to prevent leakage between the rotating shaft of a pump and its housing.

Formerly this had been done by using several lengths of soft packing wound round the shaft and held in place in a 'stuffing box'. Such a system has many drawbacks; the packing must be regularly inspected and tightened to take up wear and it must be entirely replaced at frequent intervals. Since the packed gland relies for lubrication on the fluid being pumped it can never completely eliminate leakage.

The Flexibox mechanical seal was originally developed in 1938 at Manchester oil refinery to stop leakage of liquid sulphur dioxide from centrifugal process pumps. By means of schematic cartoons the film shows the principle of this first seal and shows how further refinements have been added as time goes on.

The latest addition to the range is the PTFE fitted seal which has been specially designed to deal with corrosive fluids at high temperatures. This it is claimed to do admirably. Under ideal conditions it is said to be effective at temperatures up to 250°C and pressures of 800 pounds per square inch.

The film concludes by showing some of the applications of Flexibox seals in the food and drink industries, in apparatus for refuelling aircraft in flight, in power stations, in atomic power plants, and in industrial, domestic and commercial refrigerators.

UK Synthetic Rubber

The first full-scale plants in Britain to make synthetic rubber are to be erected at Fawley, Hants, the Esso Petroleum Co. announced this week. Plans are well advanced for the construction at the Esso refinery, Fawley, of a plant to produce butadiene, which will be fed into a new £5,000,000 factory shortly to be built on an adjacent site by the International Synthetic Rubber Co. formed by Dunlop. These plants are expected to save about $30,000,000 a year by producing 50,000 tons of rubber annually, approximately equivalent to the present total of Britain's imports from the US of the same type of rubber, GR-S. The plants are due for completion in 1958.

THE THIRD DIMENSION IN CHEMISTRY. By A. F. Wells. Oxford University Press, London. 1956. Pp. 143. 21s.

As Dr. Wells points out in the preface, a real understanding of structural chemistry calls for some appreciation of the third dimension. To the experienced chemist this is second nature, but there is little doubt that the majority of mankind (and this often includes quite advanced students of chemistry) tends to think two-dimensionally. Dr. Wells' little book is an attempt to counteract this tendency, and it must surely prove quite successful as such. The treatment is planned with great ingenuity and is remarkably lucid and simple.

The first two-thirds of the book contains very few references to chemistry: it is concerned with laying the geometrical foundations of crystal structures in terms of the properties of polygons and polyhedra and their packing arrangements. It is an easy step from such considerations to those of the shape, symmetry and internal structure of crystals. Indeed, the first real progress towards a knowledge of the internal structure of crystals came from considering the packing of polyhedra, and Dr. Wells brings this point out very clearly. Furthermore, the problem of the structures of ionic crystals is essentially one of packing together charged spheres. The final one-third of the book shows how these ideas may be applied simply and successfully to particular crystalline structures.

The book is well illustrated throughout, and at the back there are 16 plates showing typical crystal forms and structures. The photographs of the latter have been suitably duplicated for stereoscopic viewing.

The student and graduate alike will derive much pleasure, insight and knowledge from this expert yet simple treatment of a very important aspect of chemistry.—H. MACKLE.

SPECTROCHEMICAL ABSTRACTS, Vol. IV. 1946-1951. By E. H. S. van Someren & J. Lachman. Hilger Publications, Hilger & Watts Ltd., London, 1955. Pp. 178. 30s.

This publication, which is of considerable value to anyone dealing with spectrochemical work, is uniform in format with the earlier volumes of the series. It is arranged in three sections. There is first an index of papers for the years indicated in the title, giving the title of each publication and literature reference, the papers being arranged under authors' names. There is then a brief index to elements observed as minor constituents of samples, which might otherwise be overlooked in using the book for reference. Finally there follows the most important section, the abstracts themselves. These are arranged under a logical series of headings, and the space given to each paper allows an adequate account of the subject matter to be given. Cross-referencing in a work such as this always presents a problem, but it appears to have been adequately tackled. The only matter for regret is that there is at least a five-year lag between the publications and the date of presentation of the abstracts to the user. It is clear that the publishers are fully alive to this drawback, and a circular accompanying the book asks for information which may help them to decide if an economic solution is possible.—CECIL L. WILSON.

ORGANIC SYNTHESES. Volume 35. Edited by T. L. Cairns. John Wiley & Sons Inc., New York; Chapman & Hall Ltd., London. 1955. Pp. 122. 30s.

The preparation of steroids is featured in the present volume of 'satisfactory methods for the preparation of organic chemicals'. L. F. Fieser has submitted two classical dichromate oxidations of cholesterol, the first yielding the diketone Δ^4 cholesten-3:6-

dione and the second proceeding via the dibromide to monoketone Δ^4 cholesten-3-one and hence by isomerization to Δ^4 cholesten-3-one.

The preparation of the last-named compound by the Oppenauer oxidation of cholesterol with aluminium iso-propoxide is also described and it is irritating to find these two procedures, each using the same starting material, printed side-by-side without any guidance as to their relative merits. Nor can the reader himself make any reliable appraisal for, although the first method gives a higher overall yield of product with a slightly higher melting point, this group of workers used fresh cholesterol of high quality while the second group used a commercial grade. When alternative procedures are included it would appear a not unreasonable request that they should have the same group of checkers and the same starting material and final crystallization solvent.

There are also included the preparation of a number of sulphur compounds including *p*-toluene sulphenyl chloride, thiobenzophenone, methyl-2-thienyl sulphide, 2- furfuryl mercaptan and diethyl mercaptoacetal.

The index at the back of this volume covers from volume 30 onwards.—J. R. MAJER.

COMPREHENSIVE INORGANIC CHEMISTRY. Vol. IV. Zinc, Cadmium & Mercury; Scandium, Yttrium & Lanthanide Series. By H. M. Cyr, T. D. O'Brien and the Editors M. C. Sneed and R. C. Brasted. Van Nostrand Co. Inc., New York; distributed by MacMillan & Co., London. 1955. Pp. xii + 193. 37s 6d.

This book constitutes the fourth volume of an 11 volume reference work on the chemical elements and their inorganic compounds. The first three volumes treated: (I) the principles of atomic and molecular structure, theoretical and applied nuclear chemistry and the actinide series; (II) copper, silver and gold; (III) the halogens. The present volume presents an up-to-date account of the chemistry and technology of the rare-earth elements and of zinc, cadmium and mercury.

The chapter on zinc may be taken as representative. It covers 54 pages and deals with many different aspects:—history, occurrence, metallurgy, grades, purification, physical properties, alloys, role played in plant and animal life, corrosion and its prevention, uses, chemical properties, zinc oxide and other zinc compounds. Ten pages of this chapter are devoted to the physical properties of zinc oxide, its chemical reactivity and its uses, and 17 pages to the description of other zinc compounds ranging from the oxy salts to zincates through compounds such as cobaltite, periodate, nitride, phosphide, telluride and thiocyanate.

The chief physical constants of the elements are presented in a tabular form which is particularly attractive. It should be stressed that the treatment is necessarily not comprehensive and many inorganic compounds are not even mentioned. The reader must refer to the literature indicated for information on such compounds and topics. What is particularly to be recommended about this volume is the emphasis which has been placed on chemical properties and relationships and the correlation of these with atomic and molecular structure, position in the periodic classification of elements and the basic ideas of modern electrolytic theories.

This is not a text-book for the uninitiated. It assumes a knowledge of reasonable standard in the realms of mathematics, physics and chemistry and by this assumption much elementary material usually present in volumes on inorganic chemistry has been excluded. This trims the volume down to a reasonable size and makes it eminently suitable for use by the advanced worker in university, industry or research laboratory.

The chemistry of scandium, yttrium and the lanthanides is dealt with in relatively great detail. Extensive tables summarize the radiation data for all the known isotopes of these rare earths, and a fairly full account is given of the properties and reactions of a surprisingly large number of salts of these elements. The nomenclature adopted throughout this book is that recommended by the International Union of Pure and Applied Chemistry.

Volume IV of the series lives up to the standard of the earlier members. It can confidently be recommended for those requiring a thorough though not exhaustive treatment of the chemistry of these elements at an advanced level.—T. S. WEST.

Nuclear Committee Chairman

Professor Nicolaides, of Greece, has been appointed chairman of the special nuclear committee of the Council of OEEC.

• HOME •

Six Months' Price Peg

Johnson, Matthey & Co. Ltd., melters and assayers, bullion refiners, manufacturing and analytical chemists, and engineers specializing in precious metals, announce that during a six months period beginning 1 February 1956 their refining and manufacturing charges will not be increased. At the end of the period the position will be reviewed.

New British Oxygen Works

The British Oxygen Co. have built a works capable of compressing 500,000 cu. ft. of oxygen per week at Dundee. The works also includes a plant for producing dissolved acetylene at the rate of 350,000 cu. ft. per week.

Long Service Awards

The Fuel Research Station of the DSIR recently paid tribute to three members of its staff whose combined service totalled more than 100 years. One was awarded the Imperial Service medal and all three received cheques.

British Trade Fair to be Held in Finland

Speaking at the annual meeting of the Finnish-British Trade Association in Helsinki on 27 March, Sir Norman Kipping, director-general of the Federation of British Industries, announced plans for an all-British trade fair to be held there in September next year. The fair, he said, would be sponsored by the Federation of British Industries, the London Chamber of Commerce and the Finnish-British Trade Association, and would be organized by the FBI's subsidiary, British Overseas Fairs Ltd.

Industrial Application of Gas Turbine

The 10,000 kw. gas turbine power station at the Ministry of Supply's National Gas Turbine Establishment, Pyestock, Farnborough, Hants, has been synchronized with the National Grid. The gas turbine, which was constructed by C. A. Parsons & Co. Ltd., is of the open-cycle, two-line type with intercoolers, runing on liquid fuel. A feature of the installations is that waste heat from the exhaust gases provides site heating for the Establishment through a district heating system. It is the first time such a system has been used with a gas turbine and it enables an overall efficiency of 40 per cent to be obtained.

Laboratory Glassware on Show

Latest types of laboratory glassware manufactured by Quickfit & Quartz Ltd., of Stone, (Staffs), were on show at an exhibition arranged by the Liverpool section of the British Association of Chemists at the College of Technology, Liverpool, on 28 March. The centrepiece of the firm's stand was a semi-automatic counter-current liquid/liquid extraction machine, comprising 50 all-glass tubes which are agitated by an electric motor.

Boys Hostels Association

The annual dinner of the John Benn Boys Hostels Association will be held on Wednesday, 9 May, at Grosvenor House, Park Lane, London W1. Chief speakers will be Lord Mancroft, parliamentary under-secretary to the Home Office, Brigadier Sir John Hunt, leader of the Everest expedition, and Mr. T. R. Garnett, Master of Marlborough College. Tickets, which can be obtained from the appeal secretary, Bouverie House, Fleet Street, London EC4, are 30s each for the first two, and 25s each thereafter.

New Branch Office

Mathews & Yates Ltd., of Manchester, manufacturers of fans and air conditioning equipment, announce that they have opened a new branch office at Jacey House, the Lansdown, Bournemouth (Telephone Bournemouth 2493). Mr. J. R. Barlow, formerly manager of the company's Birmingham branch, will be in charge. Mr. A. T. Barlow will now be in charge of the Birmingham branch.

BoT Standards Department

The Board of Trade announces that with effect from 3 April 1956, its Standards Department will revert to its former title of Standard Weights & Measures Department. This department is responsible for the central administration of the Weights and Measures Acts and Regulations, and the Board consider the change of title desirable to prevent confusion between the functions of that department and those of the British Standards Institution, which is concerned with the general standardization of industrial products.

• OVERSEAS •

Copper Sulphate in 1955

Production of copper sulphate in 1955 rose 20 per cent over 1954, reversing the down trend since 1952, according to the Bureau of Mines, United States Department of the Interior. Shipments increased 19 per cent and were 1,000 tons in excess of production.

$500,000 for Expansion

Canadian Industries Ltd., plan a $500,000 expansion programme for its plants at Beloeil, Quebec, and Nobel, Ontario. The announcement said $250,000 will be spent to increase nitrone production facilities at Beloeil, and another $250,000 to expand nitric acid capacity at Nobel.

Restoring Zirconium Plant

At the request of the US Atomic Energy Commission, the Bureau of Mines is to restore to operating condition the Government's zirconium production plant at Albany, Oregon.

Stepping-up Sulphuric Acid Output

This year Mexico will increase the production of sulphuric acid by 160 metric tons daily at six new plants. Mexico's sulphuric acid production rose from 33,365 tons in 1947 to 125,000 tons in 1954. Production now totals 360 tons a day.

Aluminium Price Increase

Following the action of the Kaiser Aluminium & Chemical Co. last month, the Reynolds Metals Co. has increased the price of its aluminium by 1¼ cents a pound. The increase brings the price of aluminium pig to 24 cents per pound and ingot to 25.9 cents per pound.

Paraffin Oil Find

Crude paraffin oil has been struck during drilling operations by Santos Ltd., at Wilkatana, 30 miles north of Port Augusta, South Australia. Chemists in Melbourne have confirmed the conclusions of the South Australian Department of Mines that the samples submitted by the company are those of a natural crude oil, of the paraffin series. The samples were described as containing a mixture of the heavy petroleum oils, being identical with unrefined petrolatum. Other companies, including Australian Oil Exploration Ltd., had relinquished their leases in this area after surveys and testing.

First Plant of Its Kind

Electric Reduction Co. of Canada Ltd., a subsidiary of Albright & Wilson Ltd., of Birmingham, England, will employ about 500 workers when the plant they are to build in Hamilton, Ontario, for manufacturing sulphuric acid and 'wet process' phosphoric acid, and the processing of phosphorus, is completed next year. The plant will be the first of its kind in North America.

Spanish Atomic Reactor

Spain's first atomic reactor is to be built near Madrid by the General Electric Company. The reactor, which will be built for the Spanish Nuclear Energy Commission under an agreement with the US Government, will produce 3,000 kW of power for use in agricultural and medical research. The plant will be the 'swimming pool' type with a radioactive water-cooled core.

Italy Drops Oil Bill

The Italian Government has abandoned an attempt to upset the world-wide 50-50 profit sharing ratio ruling between the big oil companies and the countries where they produce the oil. The bill, introduced last October, would have set up a 60-40 ratio in Italy's favour. A new bill, involving a sliding scale of royalties, is regarded as being unrealistic.

West German Chemicals

West Germany's chemical exports in 1955 amounted to DM 3,400,000,000, an increase of 15 per cent on the previous year. The export figure represents 24 per cent of the total value of chemical production and 13.3 per cent of the total value of West German exports. West Germany's share in the world production of chemicals was about six per cent in 1954 and 1955.

Self-Sufficiency Would Cost $8,000,000

Although domestic production is increasing, Mexico still imports 25,000 tons of caustic soda a year. Most is imported from the US, with the UK and Germany sharing 10 per cent of the market. Mexico's annual production of caustic soda is 26,500 tons. The National Bank of Foreign Commerce, a Government agency, estimates that if Mexico is to become self-sufficient in this commodity, an investment of $8,000,000 will be required.

· PERSONAL ·

SIR MILES THOMAS, who is resigning from the chairmanship of BOAC, has been appointed a director of Monsanto Chemicals Ltd. and will become chairman of the company not later than 1 July. He will succeed MR. E. A. O'NEAL, JR., who is unable to continue as chairman owing to the call of his duties in America as a director of Monsanto Chemical Co. Mr. O'Neal will remain a director of Monsanto Chemicals Ltd.

PROFESSOR E. L. HIRST, M.A., D.Sc., LL.D., F.R.S., was elected president of the Chemical Society at its recent annual general meeting in Nottingham. DR. J. CHATT, M.A., Ph.D., F.R.I.C., was elected honorary secretary, and PROFESSOR E. D. HUGHES, D.Sc., F.R.I.C., F.R.S., was elected a vice-president. The following members of council were elected: PROFESSOR R. M. BARRER, D.Sc., Sc.D., F.R.I.C., PROFESSOR A. G. EVANS, Ph.D., D.Sc., F.R.I.C., PROFESSOR L. HUNTER, Ph.D., D.Sc., F.R.I.C., DR. G. W. KENNER, M.Sc., Ph.D., PROFESSOR B. LYTHGOE, M.A., Ph.D., F.R.I.C., DR. A. MACCOLL, M.Sc., Ph.D., and MR. L. A. K. STAVELEY, M.A.

PROFESSOR F. H. GARNER, O.B.E., Ph.D., M.I.Chem.E., F.R.I.C., director of the department of Chemical Engineering at Birmingham University, has been appointed chairman of the Water Pollution Research Board of DSIR as from 1 April, in succession to PROFESSOR D. M. NEWITT, M.C., D.Sc., M.I.Chem.E., F.R.S.

MR. W. B. H. GALLWEY has been appointed chairman of British Acheson Electrodes Ltd. as from 1 April. He succeeds SIR ARTHUR MATTHEWS, O.B.E. Mr. Gallwey is managing director of Union Carbide Ltd., London, and managing director of Gemec Ltd.

DR. GWEN J. THOMAS, until lately a research chemist at Aberdeen, who was recently made a fellow of the Lister Institute in London where she will continue her research work, was married to DR. DONALD WALKER, a lecturer and research chemist, at Seion, Carreglefm, Anglesey, on 24 March.

MR. E. A. MURPHY, M.Sc., F.R.I.C., F.I.R.I., chief of the team of research chemists who founded the world industry of latex foam rubber 28 years ago, and MR. HENRY TREVASKIS, A.F.R.Ae.S., who has developed the gun-firing controls used in British Fighter aircraft since 1937, are the new key men of Dunlop's expanding research and development organization at Fort Dunlop Birmingham. Mr. Murphy, general development manager at the research centre, has been appointed the director of research in charge of the central research division; Mr. Trevaskis, director of the Dunlop Rim & Wheel Co. Ltd., and chief designer of the aviation division has been appointed director of development in the new organization.

MR. C. S. HARRIS, a senior general manager, has been appointed a director of Morgan Crucible Company.

MR. CHARLES STEVENS, LL.B., assistant secretary of the ICI Pharmaceuticals Division at Wilmslow, Cheshire, has been appointed chairman of the Manchester Regional Hospital Board. Mr. Stevens, who is a barrister, has been with ICI for seven years. Prior to joining ICI he was with Glaxo Laboratories.

DR. M. CRAWFORD, B.Sc., Ph.D., lecturer in chemistry and pharmaceuticals at the College of Technology, Belfast, has resigned to take an appointment as Professor of Chemistry in the department of chemistry at Makerere College, Kampala, Uganda.

MR. RICHARD WOOLLEY has been appointed a director of Benn Brothers Ltd., proprietors of THE CHEMICAL AGE. Mr. Woolley joined Benn Brothers in 1937 and became editor of *The Newspaper World* a year later. He also became editor of *The Newspaper Press Directory* in 1949 when it was completely revised to be, with its Centennial Issue, the most comprehensive Press directory in the world. More recently Mr. Woolley was appointed editor of *The Cabinet Maker*. He is a member of the national executive committee of the Furnishing Trades Benevolent Association.

MR. GEORGE E. GARLAND, B.S., has been appointed manager of the recently established petrochemicals sales division, domestic sales department, of the Texas Com-

pany. The division will be responsible for market development and sales throughout the country of petrochemical products to be manufactured by the Texas Company. Mr. Garland has been in the chemicals and petrochemicals sales field for 22 years, and before joining Texaco, he was a consultant. From 1934 till 1944 he was in the sales organization of the Barrett division of the Allied Chemical & Dye Corporation.

Two new directors have been appointed to the board of Holman, Mitchell & Co. Ltd., of St. Helens, Lancs. They are MR. T. DENNY, the general sales manager of the company, and MR. J. C. MACGREGOR, M.A., an accountant. MR. E. SAXON, the staff and office manager, has been appointed the company's secretary.

Obituary

MR. E. A. BROUGH, the founder and chairman of E. A. Brough & Co. Ltd., of Liverpool, died on 20 March.

I.Chem.E. Examinations

New Regulations in Force

LATEST regulations for the admission of student, graduate and corporate members of the Institution of Chemical Engineers together with regulations for the examination of the Institution have recently been published. These regulations were first issued in June 1954.

The examination subjects are as follows:

Part 1

Paper A—Physical chemistry and principles of thermodynamics.

Paper B—Inorganic and organic chemistry.

Paper C—Strength of materials, machine and structural design.

Paper D—Engineering drawing.

Part 2

Paper E—Combustion processes, heat transfer and heat engines.

Paper F—Flow of fluids and theory of mass transfer.

Paper G—Process plant.

Paper H—Plant construction and works practice.

Part 3

Home paper; a problem in chemical engineering plant design.

Detailed examination syllabuses are given in appendix I of the publication.

Examination requirements for the several grades of memberships are as follows:—

Student—Part 1.

Graduate—Parts 1 & 2.

Associate member—Parts 1, 2 & 3.

Member—No further academic requirement beyond that for associate member.

The Institution of Chemical Engineers describes itself as being first of all a qualifying body with a duty to prescribe courses of study, to hold examinations and to assess training and experience whereby professional qualifications may be conferred.

The Institution is also concerned with facilities for chemical engineering education, chemical engineering research and associated documentation, the publication of papers and the holding of meetings on subjects of interest to chemical engineers, and other matters relating to the promotion of chemical engineering science and its application.

Application form for entrance to the 1956 examination, returnable not later than 1 June may be obtaned from The General Secretary of the Institution, 56 Victoria Street, London SW1.

Faraday Medal Award

A PIONEER in atomic research, the 77-year-old German scientist, Professor Otto Hahn, Präsident der Max-Plancke-Gesellschaft zur Forderung der Wissenschaften, was awarded the Faraday Medal at The Chemical Society's anniversary three-day meeting at Nottingham University at the end of March.

Professor Hahn, who was presented with the medal by Professor W. Wardlaw, the president of The Chemical Society, said: 'What do you do with a gift horse? A gift horse as big perhaps as the clue to nuclear fission, atomic bombs, atomic power stations, and nearly all things big and wonderful? If you are a scientist, it seems, the dry rigour of your craft demands that you should look it in the mouth!'

Johnson, Matthey & Co. Ltd., metallurgists, refiners and assayers, of 78 Hatton Garden, London EC1, are building a chemical factory at Royston, Herts.

Publications & Announcements

REPORTS of recent investigations at the Colonial Products Laboratory are contained in *Colonial Plant and Animal Products*, Vol. V, No. 2 of which has just been published by HM Stationery Office, price 5s. 'Pyrethrum Trends and Prospects' are discussed in an article by A. J. Feuell of the Colonial Products Laboratory. 'Basically, there are three factors', says Mr. Feuell, 'which enable pyrethrum to maintain its position in the gamut of modern insecticides: its rapid "knock-down" action, its low mammalian toxicity and its freedom from taint.' Mr. Feuell goes on to say that these properties give pyrethrum extracts obvious advantages where foodstuffs and similar materials are concerned.

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LATEST edition of the *CIBA Review* (February 1956) appears in a new guise. Better quality paper has been used and changes in layout have been made. Wool is the subject of this issue, sections being devoted to wool fibre and modern trends in printing, dyeing and finishing. This section discusses the dyeing of bright turquoise blue and green shades of high fastness on wool and unions. Hitherto, says the article, production of these shades has only been possible with the group of sulphonated triaryl methane dyes. Dyes of this class give very bright dyeings and in many cases the wet fastness qualities are quite adequate. Their maximum light fastness, however, is only three which means they are not suitable for dyeings for which high light fastness is specified. On the other hand a dye of good light fastness, Chlorantine Fast Turquoise Blue GRLL, a sulphonated copper phthalocyanine, has been produced for dyeing cellulosic fibres. This dye, however, tends to give unsatisfactory results on wool. A solution to this problem has been found, it is claimed, in Neovadine AN, a textile auxiliary, which when added to a weakly acid dyebath fixes the dye on the wool and ensures excellent colour yield, good levelling and very good fastness properties.

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THE National Smoke Abatement Society's annual conference in September last had the largest attendance of any meeting of its kind yet held in this country. The 'Proceedings of the Bournemouth Conference, 1955', containing all papers and discussions in full, with illustrations, has now been published at 12s 6d. The publication contains information on important and topical aspects of the air pollution problem. These include descriptions by experts of several of the most modern methods of centralized domestic heating, and a symposium with discussion on the Clean Air Bill and the administrative problems arising from it. Also included is a verbatim account of the session with which the Conference opened, in which questions on the Clean Air Bill were answered by the Rt. Hon. Alfred Robens, MP, and Mr. Gerald Nabarro, MP. The section of the proceedings devoted to central heating contains accounts of four systems: the district heating scheme at Pimlico, which is perhaps the most successful of its kind; a form of electric floor-warming which operates on the thermal storage principle; a new form of water-circulating system using relatively small pipes; and a system of whole-house warming by ducted warm air, using several alternative kinds of fuel. Most of the second half of the volume is concerned with an examination of the relationship between the Beaver Report, the Clean Air Bill, and the problems the local authorities must cope with in putting them into practice. Last there is the Des Voeux Memorial Lecture given by Dr. A. Parker, director of the Fuel Research Station.

* * *

THE January-February issue of the *Incorporated Plant Engineers' Journal*, somewhat abbreviated because of the printing dispute in London, has recently been published, price 5s for non-members. Articles in this issue include 'Modern Textile Drying Methods' by K. S. Laurie and 'Dust Generation and Control in Foundries' by W. H. White. From this article the following conclusions are drawn: (1) Dust should be prevented from becoming airborne by adding moisture where practicable to all dry sand (2) All waste materials should be removed from the foundry area (3) A minimum disturbance of dry sand should occur within the foundry area (4) Good unit air control should be provided at every source of generation of dust and fumes.

Next Week's Events

MONDAY 9 APRIL

British Ceramic Society

Stoke-on-Trent: North Staffordshire Technical College, 7.30 p.m. 'Experiments in Drying of Clay' by D. M. Newitt, D.Sc., F.R.S.

Society of Instrument Technology

Cheltenham: The Rotunda, 7.30 p.m. Annual general meeting followed by film show.

SCI (London)

London: William Beveridge Hall, Senate House, The University of London WC1. Two-day symposium 'Applications of Infra-Red Spectroscopy in Chemical Industry'

TUESDAY 10 APRIL

Institution of Chemical Engineers

London: The Geological Society, Burlington House, Piccadilly W1, 5.30 p.m. 'Patents in Chemical Engineering' by H. I. Downes, M.Sc., F.C.I.P.A.

SCI (Chemical Eng. Group)

Middlesbrough: Constantine Technical College, 7 p.m. 'The Design of Dual Firing Systems for Coal & Oil' by Dr. J. H. Bock, D. Ing., B.Sc., M.I.M.E., M.Inst.F.

Society of Instrument Technology

Manchester: College of Technology, 7.30 p.m. 'Air Conditioning Instrumentation'

Society for Analytical Chemistry

London: Imperial College of Science & Technology SW7, 6.30 p.m. 53rd ordinary meeting of the Physical Methods Group.

WEDNESDAY 11 APRIL

Institution of Chemical Engineers

Leeds: The University, 7 p.m. 'Commissioning a Major Coal-Preparation Plant' by A. J. C. Older.

Society for Analytical Chemistry

London: The Feathers, Tudor Street (off Bouverie Street), Fleet Street EC4, 6.30 p.m. 'Complexones in Microchemistry' by H. J. Cluley, M.Sc., F.R.I.C., and C. Whalley, B.Sc., F.R.I.C.

Birmingham: The University, Edmund Street, Birmingham 3, 7 pm. 'The Physiological & Biochemical Background of Microbiological Assay' by R. H. Nimmo-Smith, M.A., D.Phil., M.B., Ch.B.; 'The Influence of Physical Factors on the Microbiological Assay of Antibiotics' by J. W. Lightbown, M.Sc., Dip. Bact., F.P.S.; 'Practical Considerations of Microbiological Assay' by K. A. Lees, F.P.S., D.B.A.

SCI (Food Group)

London: Royal Society of Medicine (Barnes Hall), Wimpole Street W1, 6 p.m. 'Iodine & Fluorine'. 'Iodine' by Professor M. M. Murray and J. C. M. Holman (Chilean Iodine Educational Bureau). 'Fluorine' by Professor M. M. Murray, Dr. G. Wynne Griffith, Miss J. R. Forrest, and Dr. J. Longwell.

SCI (Corrosion Group)

Birmingham: The University, Edgbaston. Two-day symposium 'Corrosion Prevention in Packaging & Storage'. Wednesday, 2.30 to 5.30 p.m. Thursday, 9.15 a.m. to 12.45 p.m.

SCI (Oil & Fats Group)

Liverpool: The University, 7 p.m. Annual general meeting and 'Oil Colorimetry' by K. A. Williams, B.Sc., Ph.D., M.Inst.P.

SCI (Plastics & Polymer Group)

London: William Beveridge Hall, Senate House, The University of London WC1. Three-day symposium 'Epoxide Resins' (Their Chemistry & Structure in Relation to Their Properties & Applications). Wednesday, 10 a.m. Thursday 10 a.m. Friday 10 a.m. Chairmen:—J. J. P. Staudinger, Dr. Ing.; S. Whitehead, M.A., D.Sc., M.I.E.E.; and Dr. N. J. L. Megson, D.Sc., F.R.I.C., F.P.I.

THURSDAY 12 APRIL

Institution of Chemical Engineers

London: The Institution of Civil Engineers, Great George Street SW1, 5.30 p.m. 'The Control, Conveyance, Treatment & Disposal of Radioactive Effuents' by W. ... Wilson, P. A. White and J. G. Milton.

Manchester Pharmaceutical Association

Manchester: Houldsworth Hall, 7.45 p.m. Annual general meeting.

Society of Leather Trades' Chemists

Cambridge: Chemistry School, Pembroke Street. Two-day symposium 'Vegetable Tannins'. Start 9.30 a.m. each day. Chairmen:—Professor R. D. Haworth, F.R.S., and Dr. F. E. King, F.R.S.

SCI (Microbiology Group)

London: Medical Society of London, 11 Chandos Street, Cavendish Square W1, 6 p.m. 'Microbiology in Industry' by H. J. Bunker.

FRIDAY 13 April

Oil & Colour Chemists' Association
Manchester: Waldorf Restaurant, Cooper Street, 6.30 p.m. Annual general meeting.

Society of Dyers & Colourists
Manchester: College of Technology, 10 a.m. One-day symposium. Four papers.

Society of Glass Technology
St. Helens: St. Helens Co-operative Wholesale Society, Baldwin Street, 6.15 p.m. 'The Functions of the Newly-Formed Glass Research Association' by Dr. R. G. Newton.

The Chemical Society
St. Andrews: Chemistry Department, St. Salvators' College, 5.15 p.m. 'A New Chemistry' by Dr. R. N. Hazeldine, B.Sc.

SATURDAY 14 APRIL

Institution of Chemical Engineers
Manchester: Reynolds Hall, College of Technology, 3 p.m. 'Grinding of Quartz-Limestone Mixtures' by S. W. F. Patching, and J. A. Holmes.

Law & Company News

Commercial Intelligence

The following are taken from the printed reports, but we cannot be responsible for errors that may occur.

Mortgages & Charges

(Note.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described herein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every company shall, in making its Annual Summary, specify the total amount of debt due from the company in respect of all Mortgages or Charges. The following Mortgages or Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary but such total may have been reduced.)

BRANKSOME CERAMICS LTD. London SW.—1 March, £1,750, deb. to T. H. Lawley, Winkfield; charged on land at Bourne Valley Road, Branksome. *£15,000. 14 December 1954.

CIMEX-FRASER TUSON LTD. Orpington, manufacturers of insecticides etc.—1 March, £10,000 charge to Reunion Properties Co. Ltd.; charged on two pieces of land at Cray Avenue, St. Mary Cray. *£10,000. 11 November, 1954.

JOHN A. GARDINER LTD. Ely (Cambs.), scientific instrument manufacturers and dealers etc.—29 February, £801 1/6 charge (sec. 97, 1948 Act), to Cambridge Building Society; charged on 7 Egremont Street, Ely.

Company News

Olin Mathieson Corp.

Substantial increases in assets, net working capital, sales and earnings are reported by Olin Matheison Chemical Corp. in its annual report released to stockholders. Total assets at the end of 1955 rose to $621,777,000 from $497,050,000 in 1954, a rise of 25 per cent. Net working capital, at the end of 1955, totalled $193,632,000 compared to $183,211,000 at the end of 1954. Mr. John M. Olin, chairman, and Mr. Thomas S. Nichols, president, in their message to stockholders, said that net sales rose to a record of $560,480,000 in 1955 compared to $502,478,000 in 1954. Net profits in 1955 totalled $44,558,000 compared to $38,075,000 in 1954. Profits increased 17 per cent and earned $3.51 per share of common compared to $3.11 in 1954 on a smaller average number of shares outstanding in that year. Payment of dividends on the convertible preferred stock was made at the prescribed rate of $4.25 per share annually, or $1.0625 per share quarterly. Total dividends paid in 1955 on this stock amounted to $948,000.

Hilger & Watts Ltd.

At the recent annual general meeting of the company in London, Mr. G. A. Whipple, M.A., M.I.E.E., the chairman, said that in the year under review sales were a record, increasing by 15 per cent over the previous period. The trading surplus was £209,900, an increase of £28,186. The directors recommended an increase of one per cent, making a 10 per cent dividend on the ordinary shares. The company, manufacturers of scientific instruments, have made great strides in the field of infra-red spectroscopy, and have supplied many spectrophotometers to the oil and chemical industry. During the year the pilot unit at the new factory at Debden, Essex, came into full production.

Albright & Wilson Ltd.

In a preliminary statement of profit issued by the company, the trading profit for the year ended 31 December, after the deduction of all charges except depreciation, was £3,199,914, compared with £3,133,575 in 1954. The profit, after taxation, totalled £780,551, compared with £881,616 in the previous year. On 28 March this year the directors declared a second interim dividend of 13 per cent, payable on 15 May, on the ordinary capital excluding the stock resulting from the rights issue. Tax will be deducted at the standard rate in force at the time. This dividend will be recommended as a final dividend, making 18 per cent for the year 1955.

Borax Consolidated Ltd.

Trading profits of this group showed a marked increase during the year under review, reaching the figure of £2,438,190, compared with £1,712,834 in 1954. Group profits, before taxation, totalled £2,309,953 against £1,588,661 in the previous year. Taxation on profits is £1,035,353—£286,112 higher than in 1954. This leaves the group's net profits (before charging profits tax in respect of dividends) at £1,274,600, an increase of £435,180 over the previous year. £500,000 has been transferred to reserve, bringing the total reserve up to £2,000,000. During the year the company began work on a new development in the US to replace

the underground mining system in use at Boron by open cast (surface) mining. Work was also started at Boron on new concentrating and refining plants which will lead to higher production at lower costs. All US refining operations are carried out at Wilmington, California, over 200 miles from Boron by rail. The new refinery will mean the saving of a huge transport bill. The directors recommend a final dividend of .8 per cent, less tax, on the deferred ordinary stock, making a total of 23 per cent, less tax, for the year. This compares with 18 per cent, less tax, for the previous year, and 11 per cent, less tax, for the year before. In his statement to shareholders the chairman, Desmond Abel Smith, M.C., said: 'The strength of our position lies in the fact that boron is used in so many different industries. Our products are sold to well over a hundred industries. We have during the past year added new products to our list and we continue our research in this country and in the US, looking for further ones.'

Dominion Tar & Chemical Co. Ltd.

Earnings of the Dominion Tar & Chemical Co. Ltd., Montreal, for the year ended 31 December 1955 were a record, the net profit rising to $3,801,852 or $1.24 per share of common against $1,875,369 or 56 cents per share in 1954. Profit from operations amounted to $10,404,013, an increase of $1,975,678. Mr. E. P. Taylor, the president, said that less than 50 per cent of the profit in 1955 was earned by the manufacture and sale of materials to the building industry. The year saw a marked growth in almost all divisions and it was expected that the growth would continue during 1956. The company's immediate plans call for expenditures in excess of $6,000,000 in 1956, and it is indicated that expenditures of a similar magnitude will continue to be required. A new tar distillation plant at Hamilton, Ontario, is planned.

Blythe Colour Works

The company's trading profit for the year under review amounted to £388,092 before the addition of £11,080 income from investments. From this will be deducted £52,037 for depreciation and auditors' and directors' remunerations, and £181,489 for tax, leaving £165,646, from which £1,711, the cost of issue of ordinary shares last year, will be deducted. After adding the carry forward together with the provision of tax not required, there remains the sum of £245,971. The company which covers a wide range of manufacturing activities: colours, stains, oxides, enamels, glazes and chemicals for the pottery and vitreous, glass, paint, rubber etc., industries, has steadily expanded and during the year acquired the minority holding in their Australian subsidiary, Blythe Colour Works (Australia) Pty, Ltd.

Market Reports

LONDON.—Quiet conditions have prevailed on the industrial chemicals market, and there has been little business on home account during the shorter week following the Easter holiday. However, the movement of fertilizers has been good with the seasonal demand well under way, and the volume of export enquiry continues to be well maintained. In the coal-tar products market conditions and prices are uchanged.

MANCHESTER.—Prices generally on the Manchester chemical market continue on a steady to firm basis, one of the few changes of any consequence during the past week being a reduction of £4 5s in sulphate of copper in sympathy with the metal, current value being £120 15s per ton, less 2 per cent, f.o.b. Liverpool. There has been a resumption of the call for contract deliveries of the alkalis and other leading heavy chemicals after the holiday stoppages at consumers and a moderate flow of fresh enquiries has been reported. Fertilizers are in fair request, with a steady demand for most of the light and heavy tar products.

GLASGOW.—The past week has been one of continued improvement in the Scottish heavy chemical market, and a good demand has been shown both for spot and contract requirements. Prices have continued steady, with only a few advances. On the agricultural side the demand for fertilizers has again been good, with—as already stated—emphasis on forward delivery. In regard to export, the continued improvement is again the general trend, and a steady flow of inquiries is being received.

Nylon Price Reductions

The Du Pont Co. has reduced the price of nylon filament yarns. At the same time the company has also reduced the prices of 'Dacron' polyester fibre filament yarns ranging from 14 to 30 per cent.

CLASSIFIED ADVERTISEMENTS

EDUCATIONAL

THE INSTITUTION OF CHEMICAL ENGINEERS

32nd (1956) EXAMINATION

APPLICATION forms for entrance to the 1956 Examination, returnable not later than the 1st June, 1956, may be obtained from the General Secretary, The Institution of Chemical Engineers, 56, Victoria Street, London, S.W.1. In applying for forms, applicants should state which parts of the examination they propose to take.

SITUATIONS VACANT

The engagement of persons answering these advertisements must be made through a Local Office of the Ministry of Labour or a Scheduled Employment Agency if the applicant is a man aged 18-64 *inclusive, or a woman aged* 18-59 *inclusive, unless he or she, or the employment, is excepted from the provisions of the Notifications of Vacancies Order,* 1952

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CHEMISTS interested in technical information work are invited to apply for post now vacant at the Research Association of British Rubber Manufacturers. Applicants should have degree in chemistry or A.R.I.C., previous experience not essential. Duties will cover all aspects of scientific and technical literature and information services, and the post provides an excellent opening for anyone desiring a career in this field. Five-day week; canteen. Rented house available nearby. Commencing salary on Technical Officer Scale £500 × 25-£675) according to age and qualifications, pension scheme. Apply **SECRETARY** at **SHAWBURY, SHREWSBURY.**

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Requests for application forms by **POSTCARD** to the Senior Recruitment Officer at above address not later than 12th April 1956. Quote Reference 1088/38.

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THE Proprietor of British Patent No. 614,096 for **"A METHOD AND MEANS FOR PRODUCING LIQUID OXYGEN OR LIQUID AIR RICH IN OXYGEN,"** desires to enter into negotiations with a firm or firms for the sale of the patent or for the grant of licenses thereunder. Further particulars may be obtained from Marks & Clerk, 57 and 58, Lincoln's Inn Fields, London, W.C.2.

THE Proprietor of British Patent No. 574803, entitled **"APPARATUS FOR THE TREATMENT OF BLOOD,"** offers same for licence or otherwise to ensure practical working in Great Britain. Inquiries to **SINGER, STERN & CARLBERG,** 1 E. **JACKSON BOULEVARD, CHICAGO 4, ILLINOIS, U.S.A.**

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